DONALD P. HAMMER
Associate Director
and
JAMES S. SOKOLOSKI
Systems Manager
Library and Information Systems
University of Massachusetts Library
Amherst, Massachusetts

# The Massachusetts Central Library Processing Service

In the world of libraries and their related institutions, the Massachusetts Central Library Processing Service is an unusual and unique organization. It is probably the only automated processing center that performs the full spectrum of monographic technical processing routines from the production of selection materials through the ordering, fiscal accounting, cataloging, and bibliographic display functions. It provides to the participant libraries many products such as catalog cards, book labels, pockets, book catalogs, special listings, and financial statements. The service has been in actual production since July 1970, and its success has strongly aided the development and effectiveness of the libraries in the higher education system in Massachusetts.

Before the project was inaugurated, the then twenty-seven libraries involved ranged in collection size from about 3,000 to 120,000 volumes, excluding the University of Massachusetts Library at Amherst. The average size of the libraries, again excluding the university, was 41,000 volumes. The student bodies of the institutions ranged from 250 to 5,500 students, the average being about 2,000. At this time, the university had a student body of 19,000 and a library of about 900,000 volumes.

The need for a policy-setting body for the project was recognized early in the planning stages. To meet that need an advisory council called the Massachusetts Conference of Chief Librarians of Public Higher Education

Institutions (MCCLPHEI) was organized. This group not only deals with policy decisions concerning the processing service, but also deals with other cooperative efforts among the participant libraries. It is interested, for example, in establishing uniform job descriptions and classifications for academic librarians in the state institutions, with the acquisition of audiovisual materials, and in establishing a formal consortium in order to obtain government funding for special projects.

A venture like this processing center can only be successful if certain basic tenets are agreed upon and adhered to by all of the participants. Obviously, the members must cooperate in all things individually, as well as through their advisory body, but beyond that they must agree to accept a standard product and to coordinate their needs with the needs of the other members. The center was at first a "catch up" program operated on a basis of massive funding and rapid development. After the initial phase of growth was passed, the operation became less restricted and it was possible to allow more diversification. The basic principle of cooperation has been maintained, however.

For the center to be a success it was also necessary for its members to agree to some practical standards. A mass production activity such as this requires acceptance of standard products whenever available. To this end, the members agreed to accept LC classification even though some of the libraries were classified in Dewey. Further, they agreed on the use of the LC catalog card format. Also, they accepted common selection sources for the first two years. These were Melvin Voigt's *Books for College Libraries* list for the New Campus Libraries Program at the University of California[1] (from which the center's informal name of BCL derives), and, in the second and successive years, the MARC tapes. In addition, the participants had to agree to accept a quota system as the means of fund distribution. In short, the principles of cooperation, standardization, and mass production have been the secrets of success in this processing service.

In order to establish and maintain an economical operation and to gain the advantage of such benefits as large discounts and inexpensive cataloging, it was necessary for the group to develop a planned program of acquisitions. The greatest economies are achieved by a volume operation. If an average of at least seven copies of a book ordered at the same time can be maintained, good discounts will be had and volume cataloging can be produced. If a system gets away from the coordinated acquisitions concept, the benefits of a volume operation are lost and costs rise rapidly. For example, in the first year of BCL, the average number of copies was 12 and the discount average was about 20 percent. By the middle of the fourth operational year the average

number of copies had dropped to 1.6 and discounts were down to 11.7 percent. The concept of planned coordinated acquisitions was no longer in force and the center was operating much like a single library as far as acquisitions were concerned.

## Operational and Administrative Problems

The problems of the processing service have been on two levels: (1) the level of day-to-day operations and (2) on the level of administration. On the day-to-day status, the center has the usual problems of maintaining an even flow of work in order to avoid the wasteful costs of slack time, or conversely, the inefficiencies of backlogs. Unfortunately, the center is subject to the same vicissitudes of any library processing agency or department–it cannot control the rate of arrival of either new orders or new books. It is, therefore, extremely difficult to maintain a constantly flowing pipeline.

Another operational problem concerns the book selection cards that are provided biweekly from MARC tapes. These cards will be discussed in detail later. This tool has served well in the past as a common selection aid, but now that the participant libraries have progressed to a point of diversity they want something more than just MARC data. In addition, they no longer care to be inundated with cards every two weeks. A committee has been established to study the problem of selection aids and suggest other approaches to a standardized but broader procedure.

On the administrative level the problems are perhaps more subtle, but just as difficult or even more difficult to solve. One of these problems concerns the use of the various services provided by the center. As is obvious, certain services, such as original cataloging, cost the processing center more to perform than others–cataloging with LC copy, for instance. If a library, therefore, consistently orders books not included on the MARC tapes, it is receiving custom cataloging while another library that orders only materials from MARC data is using the less expensive cataloging. There is, therefore, an imbalance of values received and costs incurred.

The question then arises as to how this unfair imbalance can be corrected so that no library can use only the most expensive services available. One solution to this problem, and one that the advisory group is considering, is that of allocating the processing money to the participants on the same percentage basis as the book allocations are made. This basis will be discussed later. To date, only the book funds have been allocated.

Another high level problem is that of the lack of continuous funding. The processing center is funded by the state legislature on a year-to-year basis which, in addition, provides no funds specifically earmarked for salaries and

wages. The employees, therefore, must be hired on an hourly basis and have no job security beyond the fiscal year at hand. If they are to be available for another year, they must be transferred onto the more stable university payroll at the juncture of fiscal years if BCL funds for the new year have not been appropriated on time. After the funds are appropriated, the hourly personnel are transferred back to the BCL payroll.

In the beginning of the project, it was felt that this problem would lead to a great deal of personnel turnover on the clerical level. The method used to get around this problem was previously described in print as follows: "a careful study was made to divide the unavoidable manual jobs into assembly-line steps. The goal was for each staff member to become an instant expert in one task, to learn everything about his job in three to five days. Exceptions to any routine were turned over to the exception expert."[2] This procedure tended to keep the jobs more or less simple and personnel training to a minimum.

One of the problems borne by any centralized service is the acceptance of its products or services by those for whom the products and services are intended. Libraries are notorious for their individuality. This independent attitude sometimes continues to exist even after a library joins a cooperative effort. While BCL has been fortunate in this regard, as by far most of the participants have accepted it with enthusiasm, a few have been lukewarm. These people feel that they would like to have the funds independent of the center and be able to act in "freedom." Some would like to use the funds for other than book acquisitions; i.e., to engage in special projects or acquire special materials. This diversity of interest has its value in that the advocates of change are always present, but it can defeat the purpose of a cooperative effort. As has been pointed out, "Altogether too often a library cooperative is thought of by its members as supplying each member with a service to further its own goals. Such service centers have enjoyed only limited successes. A truly cooperative center establishes goals that are not achievable by individual libraries."[3]

## Project History

Because of the relatively limited funds available for the processing of the books, as well as the short time in which all of the material had to be handled, it was decided that the University of Massachusetts Library in Amherst would serve as the processing center. The university had readily available the necessary technical knowledge in both the library and the data processing areas, and it also had the hardware required to accomplish the proposed objectives. In addition, it had the largest library of any of the state

institutions and also had some automated library systems operational. The members of the library staff who were responsible for the design and development of the BCL system were Merle Boylan, director; James H. Kennedy, associate director; and James S. Sokoloski, systems manager.

In late 1969, the Massachusetts state legislature appropriated $2 million to the project's sponsoring body, the Board of Higher Education, as the initial allocation for the program. The appropriation was divided among the institutions in proportion to the collection deficiencies of the various libraries. These deficiencies were determined by the use of the U.S. Office of Education's collection deficiency formula. To develop the system and process the books, $250,000 was also appropriated.

By late spring of 1970, the BCL project had placed orders for all of the material to be purchased and processed with the initial $2 million allocation. During this time, a second appropriation of $2 million for books and $250,000 for processing was granted by the legislature. By the middle of the summer of 1971, fourteen months after the project had started processing material, approximately 486,000 volumes, representing the total allocation of $4 million, had been purchased for the then twenty-eight institutions of higher learning in Massachusetts. The total processing cost of $500,000 represents not only the actual cost involved in processing the books, but also all of the computer system development costs and all related costs incurred in implementing and operating the system.

The third year of the BCL project was funded in the fall of 1971 in the amount of $1.5 million for books and $175,000 for processing. At this time, there were two significant changes made in the acquisition policy of the project. For the first time, the participant libraries were allowed to order any books they chose—not just those included on MARC tapes—and they could order audiovisual materials in an amount up to 15% of their BCL budgets. Both of these changes were without doubt inevitable, but they were also responsible for rising costs and less efficiency because of the increase in cataloging effort.

The 1972/73 budget year has been funded in the amount of $1,425,000 for books and $123,000 for processing. The selection source used for the first year of the program was the book list compiled by Melvin Voigt mentioned earlier.[1] The basic selection aid for the second and successive BCL years was MARC tapes.

## Production System

When a MARC tape is received in the processing center, certain items of bibliographical data describing each title included on the tape are listed on a

printout and a punched card corresponding to each book on the list is produced.

Some of the entries that appear on the MARC tapes represent analytics, ephemeral pamphlets, and books that will again appear on later tapes. In order to eliminate these items from the book selection process, the lists are examined and the corresponding punched cards representing such items are discarded. The remaining punched cards are segregated according to the vendor from whom the books will be ordered if selected by any of the institutions. These punched cards are later submitted to the computer to trigger the printing of the two-part selection cards which are sent biweekly to each of the institutions participating in the project. In figure 1, the righthand card is to be returned to the processing center if the institution desires to order that particular book. The left-hand card is retained by the institution as a record of items ordered. The dates in the lower right-hand corner show when the selection card was issued and when it should be returned to the processing center for ordering.

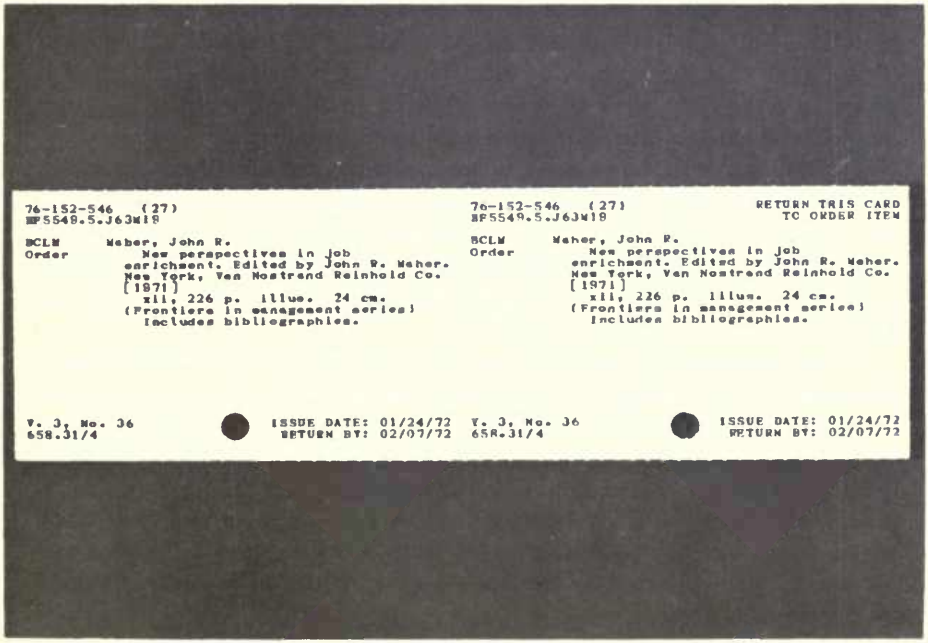



**Fig. 1. Two-part Selection Card**

When the selection cards are received at the processing center from a participating library, the identification number assigned to the institution and the LC card number are keypunched. After all requests from all institutions for a given batch of selections are keypunched, the LC card numbers on the punched cards are then matched by computer with the LC numbers in the data file, selections are posted to the file, order numbers are automatically assigned to each title selected, and the purchase order forms are produced.

The purchase order is a two-part form of which the left half contains instructions to the vendor as well as the necessary bibliographical data to order the item. The right side of the order form is the packing slip which is intended to be returned to the processing center by the vendor along with the copies of the book ordered.

At this time various edit checks are made on the data and some statistics are compiled. Among the statistics produced are the number of titles selected by each participant and the percentage that number represents of the titles on a particular weekly MARC tape.

One of the most useful reports received from the system is the financial summary (figure 2). It enables the administrators to monitor the progress of the processing center in fiscal terms as well as in quantity of materials processed. This same information is also produced for individual institutions (figure 3) so that the progress of each library can be assessed. This report is generated after each batch of orders is placed to allow the center to review the financial status of each institution on a continuing basis.

When the order forms are produced, catalog cards for all books ordered are also printed, if the data for the orders was obtained from the MARC tape file. These cards are printed on continuous card stock which must later be cut to the usual 3 by 5 inch card size for filing in card catalogs. The equipment used to trim the cards is a blade cutter that trims only the sides of the cards. The top and bottom edges are precut.

A complete set of cards includes two main entry cards, a shelflist card, a title card, a series entry, if appropriate, and multiple subject cards. These cards are computer produced using the ALA print train at eight lines per inch.

In addition to the production of catalog cards, the computer prints the spine labels using a special print train of large type font. The call number is printed on pressure sensitive labels affixed to a peel-away backing. Two labels are produced for each book, one to be placed on the spine of the book and the second to be attached to the book pocket or used in any way preferred by the receiving library.

After the catalog cards and the spine labels have been produced, it is necessary to arrange them in some temporary storage until the books on order

BCL FINANCIAL REPORT AS OF 03/23/73
SUMMARY

| | MONOGRAPHS | SERIALS | TOTAL | NON-PRINT |
|---|---|---|---|---|
| TITLES | | | | |
| ORDERED | 41,562 | 2,094 | 43,656 | 3,718 |
| CANCELLED | 1,220 | 37 | 1,257 | 13 |
| RECEIVED | 15,699 | 1,464 | 17,163 | 941 |
| SHIPPED | 12,683 | 1,167 | 13,850 | 909 |
| IN-PROCESS | 3,016 | 297 | 3,313 | 32 |
| OUTSTANDING | 24,643 | 593 | 25,236 | 2,764 |
| COPIES | | | | |
| ORDERED | 72,743 | 2,260 | 75,003 | 3,759 |
| CANCELLED | 2,192 | 45 | 2,237 | 14 |
| RECEIVED | 26,428 | 1,603 | 28,031 | 958 |
| SHIPPED | 22,138 | 1,282 | 23,420 | 921 |
| IN-PROCESS | 4,290 | 321 | 4,611 | 37 |
| OUTSTANDING | 44,123 | 612 | 44,735 | 2,787 |
| VOLUMES | | | | |
| ORDERED | 77,975 | 26,051 | 104,026 | 18,727 |
| CANCELLED | 2,434 | 420 | 2,854 | 50 |
| RECEIVED | 28,985 | 22,391 | 51,376 | 7,896 |
| SHIPPED | 24,188 | 18,917 | 43,105 | 7,561 |
| IN-PROCESS | 4,797 | 3,474 | 8,271 | 335 |
| OUTSTANDING | 46,556 | 3,240 | 49,796 | 10,781 |

| | MONOGRAPHS | SERIALS | NON-PRINT | TOTAL |
|---|---|---|---|---|
| DOLLAR VALUE | | | | |
| ORDERED | $778,713.82 | $442,513.56 | $202,314.26 | $1,423,541.64 |
| CANCELLED | 19,806.97 | 10,743.85 | 902.70 | 31,453.52 |
| RECEIVED | 298,601.26 | 321,455.61 | 50,431.01 | 670,487.88 |
| SHIPPED | 257,944.23 | 273,118.96 | 48,046.43 | 579,109.62 |
| IN-PROCESS | 40,657.03 | 48,336.65 | 2,384.58 | 91,378.26 |
| OUTSTANDING | 460,305.59 | 110,314.10 | 150,980.55 | 721,600.24 |
| EXPENDITURES | | | | |
| INVOICES | $288,588.18 | $272,169.86 | $48,273.99 | $609,032.03 |
| FREIGHT | 0.00 | 0.00 | 0.00 | 1,728.90 |
| MISC. CHGS | 0.00 | 0.00 | 0.00 | 0.00 |
| ADJUSTMENTS | 49,395.00 | 0.00 | 0.00 | 49,395.00 |
| TOTAL | 337,983.18 | 272,169.86 | 48,273.99 | 660,155.93 |
| ENCUMBERANCES | | | | |
| ON ORDER | $453,510.07 | $109,650.85 | $149,827.71 | $712,988.63 |
| IN PROCESS | 8,290.00 | 16,485.50 | 12.00 | 24,787.50 |
| SHIPPED | 8,518.60 | 33,463.50 | 3,297.86 | 45,279.96 |
| TOTAL | 470,318.67 | 159,599.85 | 153,137.57 | 783,056.09 |
| BCL QUOTA | | | ( $356,250.00 ) | $1,425,000.00 |
| EXPENDITURES | 337,983.18 | 272,169.86 | 48,273.99 | 660,155.93 |
| ENCUMBERANCES | 470,318.67 | 159,599.85 | 153,137.57 | 783,056.09 |
| QUOTA BALANCE | | | ( $154,838.00 ) | $18,212.00- |

Fig. 2. Financial Summary

BCL FINANCIAL REPORT AS OF 03/23/73
UNIV. OF MASS./BOSTON

| | MONOGRAPHS | SERIALS | TOTAL | NON-PRINT |
|---|---|---|---|---|
| TITLES | | | | |
| ORDERED | 3,162 | 27 | 3,189 | 0 |
| CANCELLED | 77 | 1 | 78 | 0 |
| SHIPPED | 1,275 | 21 | 1,296 | 0 |
| OUTSTANDING | 1,810 | 5 | 1,815 | 0 |
| COPIES | | | | |
| ORDERED | 3,164 | 27 | 3,191 | 0 |
| CANCELLED | 77 | 1 | 78 | 0 |
| SHIPPED | 1,275 | 21 | 1,296 | 0 |
| OUTSTANDING | 1,812 | 5 | 1,817 | 0 |
| VOLUMES | | | | |
| ORDERED | 3,451 | 272 | 3,723 | 0 |
| CANCELLED | 81 | 1 | 82 | 0 |
| SHIPPED | 1,416 | 241 | 1,657 | 0 |
| OUTSTANDING | 1,954 | 30 | 1,984 | 0 |

| | MONOGRAPHS | SERIALS | NON-PRINT | TOTAL |
|---|---|---|---|---|
| DOLLAR VALUE | | | | |
| ORDERED | $36,211.06 | $9,674.26 | $0.00 | $45,885.32 |
| CANCELLED | 853.40 | 149.25 | 0.00 | 1,002.65 |
| SHIPPED | 14,680.86 | 4,567.81 | 0.00 | 19,248.67 |
| OUTSTANDING | 20,676.80 | 4,957.20 | 0.00 | 25,634.00 |
| EXPENDITURES | | | | |
| INVOICES | $15,562.96 | $4,992.41 | $0.00 | $20,555.37 |
| FREIGHT | 0.00 | 0.00 | 0.00 | 55.32 |
| BCL BALANCE | 12,703.00 | 0.00 | 0.00 | 12,703.00 |
| TOTAL | 28,265.96 | 4,992.41 | 0.00 | 33,313.69 |
| BCL QUOTA | | | ( $14,040.00 ) | $56,161.00 |
| EXPENDITURES | 28,265.96 | 4,992.41 | 0.00 | 33,313.69 |
| ENCUMBERED | 19,794.70 | 4,532.60 | 0.00 | 24,327.30 |
| QUOTA BALANCE | | | ( $14,040.00 ) | $1,479.00- |

Fig. 3. Individual Library Financial Report

are received. The cards and labels for each book are inserted into a book pocket thereby making a packet of materials (figure 4) that will be filed by order number to await the arrival of the corresponding book.

At the time the computer produces the book order and the catalog cards, it also generates a "receiving packet" of punched cards which when later read back to the computer serve various fiscal and other record control functions. A packet of these cards consists of a red striped card, a yellow striped card, and one or more plain cards. The red striped card, the "receiving master," is used to notify the computer that a particular book has been received. The yellow striped card is used for fund accounting, and the plain cards indicate which institutions have ordered a particular title. In figure 5, for order number 004-0216-E, the first (or red striped) card indicates that five copies of the title were ordered from vendor number 5236. The remaining numbers on the card indicate the number of copies represented by the order as well as the number of volumes per copy. The second (or yellow striped) card contains the order number and the identification number of the vendor and the remainder of the (plain) cards contain the identification number of the library that ordered the book, the order number, and a short title. These "receiving cards" are filed by order number to await the arrival of their corresponding books.

At a later time, when the books are received from the vendor, they are unpacked and all copies of a specific title are placed together. After the books are arranged in that manner, they are taken to tab files that contain the receiving packets. The packing slip is then removed from the book that is to be checked in, and the corresponding receiving packet of punched cards is pulled from the file.

Each card in the packet is used to indicate that certain transactions have occurred concerning a given title. For example, the red striped card indicates the number of copies that were ordered and the number of volumes expected per copy. Additional fields in these cards are used to indicate the number of copies actually received and the actual number of volumes per each copy received. If all volumes of all copies are received as expected, the card in the packet is processed without change. If this is not the case, a new card is punched to indicate the number that was received and a second card is punched to indicate the items outstanding. This second card is returned to the tab file to await the arrival of the remainder of the order.

The yellow striped card is attached to the invoice that was received with the book. If the invoice did not arrive with the book, the yellow striped card is held until the invoice does arrive. The function of these yellow cards will later be explained in detail. Each of the plain cards is placed inside a copy of

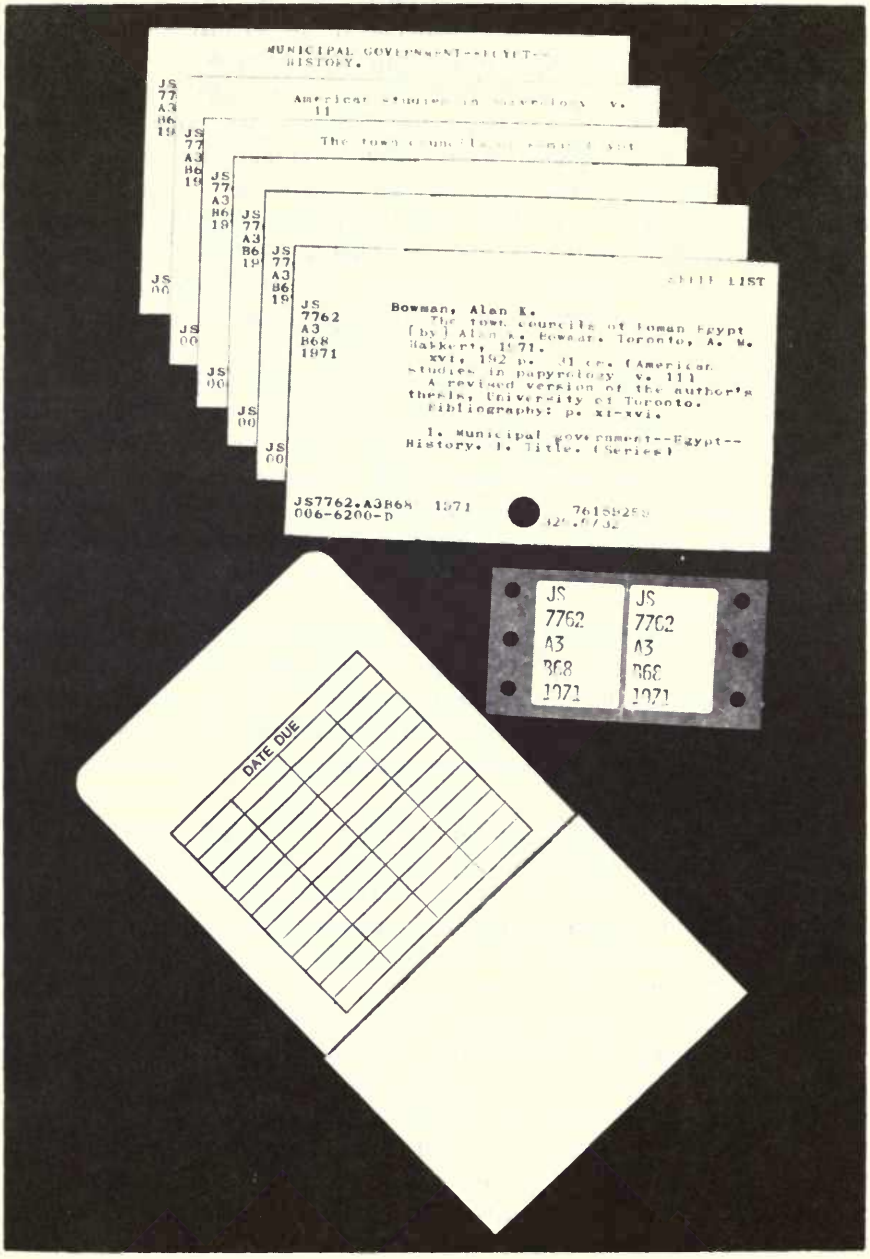



Fig. 4. Materials Packet

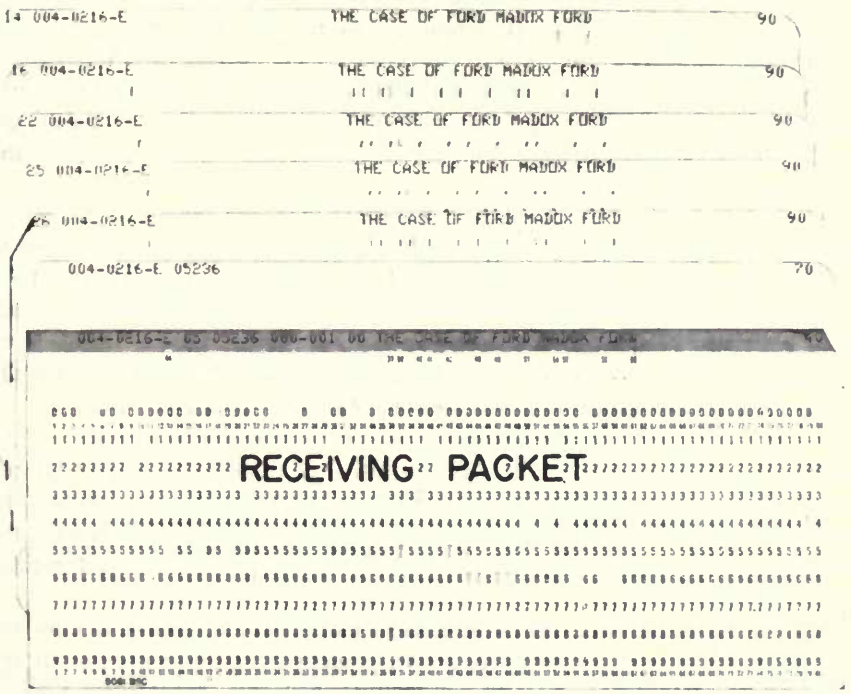



**Fig. 5. Receiving Packet**

the book. There should be a plain card for each copy of the book received. If this is not the case, an error situation exists which must be investigated.

As mentioned earlier, catalog cards and spine labels are usually produced when the order form is produced. These cards and labels are now united with their respective books and turned over to a cataloger for further processing.

If no LC cataloging data is available on the MARC tapes for a book, no catalog cards will be available for that book when it arrives in the processing center. In such cases, the original bibliographical data used for ordering is forwarded with the book to the catalogers for further searching and perhaps original cataloging.

The books for which cards have been produced are compared with the cards to determine if any differences exist or if any changes are necessary in

the bibliographical data. Those books for which no bibliographical changes are necessary are forwarded to the shipping room along with their respective cards, labels, and pockets for final processing. Those books for which bibliographical changes must be made on their catalog cards require extra processing. They are, therefore, retained in the processing center for usually no more than an additional two to three days before they are forwarded to the shipping room for final processing.

The process of changing bibliographical data is handled on computer printed edit sheets (figure 6). These edit sheets are used by the catalogers to indicate changes or additions to be made to the bibliographical data. Each change or addition results in a card or set of cards being keypunched. Each card contains the title, ID number, a code to indicate the type of change to be made, a code to indicate the bibliographic field to be changed, plus the changed data that are to appear in the specified field.

The changed data are processed by the computer at night and, at this time, a listing is produced if any errors exist in the update cards. In addition, a set of statistics concerning that particular update run is produced. The statistics include, among other things, the number of master records read, the number of edit sheets produced, and the number of catalog card records prepared for printing.

The fact that the required changes have actually been made by the computer can be verified if necessary by a second printed edit sheet. If the data are correct, the system can be signaled through a cathode ray tube to produce the required catalog cards. The computer runs necessary to produce a set of catalog cards are performed each night. After the catalog cards are produced, the books, cards, labels, and pockets are forwarded to the shipping room where they are placed in wooden bins according to their library destination prior to packing for shipment.

When the books are packed for shipping, the plain cards that were inserted in the books when they were originally received from the vendor are pulled out of the books and placed behind a punched (green striped) "box card." These box cards are punched by the computer as a separate process and provide a sequential number for the shipping boxes. When they and the plain cards are read by the computer, a bill of lading is printed. The bill of lading provides such information as the order number for each book, a truncated title, the box number, and the shipping date. The receiving library can determine, therefore, that the books intended for a specific shipment were actually received by them.

As was mentioned earlier, yellow striped cards are attached to the invoices as the latter are received. An additional card, a blue striped one that

```
                    B C L EDIT SHEET

CALL NUMBER:                                        ORD-NO :  005-5443-8
 BT                                                 VOL-ISS:  418-0049
 701.2                95 >BT701.2.W7  1972<                        /
 W7
 1977                 96 >   7J156240<              CURRENT DATE  02/22/73

                      97 >233<                      ORDER DATE  10/19/72

   01 >Wright, John Stafford.<

   04 >Mind, man, and the spirits;<

   05 >man's desperate search for meaning in intellectualism, my<
      >sticism, and the occult,  by J. Stafford Wright.<

   06 >Grand Rapids, Mich., Zondervan  Pub. House<

   08 >[1977, c1968]<

   09 >190 p.  18 cm. (Zondervan books)<

   13 >Previously published under title: What is man?<

   14 >Bibliography: p. 188.<

   60 >Man (Theology)<

A-> 80> What is man?
```

Fig. 6. Edit Sheet

provides summary data to the computer, is keypunched from the invoice data. These data include such information as gross total of the invoice, net total, freight charges, etc. With each blue invoice summary card, a yellow striped card representing each title on the invoice is returned to the computer. The yellow cards have had additional data such as gross price, net price, number of copies received, discount, etc., keypunched into them.

When all of these various cards are processed by the computer, fiscal and statistical data are produced. Among other things, invoice totals are cumulated and summary statistics are created for management purposes. A few of the statistical items of data produced for a given day include the number of books received from the vendors, the number of boxes of books shipped to the BCL participants, and the number of invoices processed that day. In addition, a summary of the price of materials acquired can be obtained, on demand, from these data. Among other items of information, the price per item, per copy, and the average discount can be retrieved.

If, during the course of day-to-day operations, it becomes necessary to determine the status of any given orders, this information can be acquired by means of a CRT display terminal. By keying in the order number, a request is made to display an order. As a result of this inquiry, such information appears

on the display screen (figure 7) as the number of copies of a specific book that were ordered, received, invoiced, and shipped to BCL libraries. Invoice numbers and dates can also be retrieved, along with fiscal data such as estimated price, net price, etc. In addition to determining the current status of a certain order, it is also possible using CRT displays to change many of the data elements in the file. The system also produces many kinds of management data in the form of statistics and production information that help to control and refine the operation.

Although MARC tapes have been the basic source of book selection for the participant libraries, other sources have been used. Such things as publishers' and vendors' sales catalogs, special subject lists, and bibliographies specifically directed at college libraries, have been frequent sources for book acquisition.

## System Characteristics

As has been mentioned, the Library and Information Systems Staff furnished a nucleus of skilled data processing and library professionals to develop the specifics of the project. They sought to automate the routine portions of each job, and fully to exploit new bibliographic resources just becoming available in machine-readable form in 1969. Eventually, a combination of batch processing and on-line techniques was implemented, supported by the hardware and software of the University Administrative Data Processing Center, which in 1969 included IBM/360, Models 30 and 40.

The System/360, Model 40 has since been replaced with a System/370, Model 145. This latter system, running under DOS is the backbone of the Administrative Data Processing Center on the Amherst campus. With 393K bytes of core available, the system has three partitions: one being used for teleprocessing and two being used for batch processing. In the two batch partitions, all input/output functions are performed by an IBM spooling package called POWER, which greatly improves the utilization of the peripheral components of the system.

For its on-line applications, the Administrative Data Processing Center utilizes a programming system called FASTER BASIC (*F*iling *A*nd *S*ource data entry *T*echniques for *E*asier *R*etrieval), an IBM type III program. Together with the System/360, Model 30, one 2314 and two 2319 direct access storage facilities, 22 visual display terminals on the Amherst campus and 4 on the Boston campus, plus 7 magnetic tape drives, 3 line printers, and other peripheral equipment, the university has an advanced data processing and communications facility to serve the Amherst, Boston and Worcester campuses.

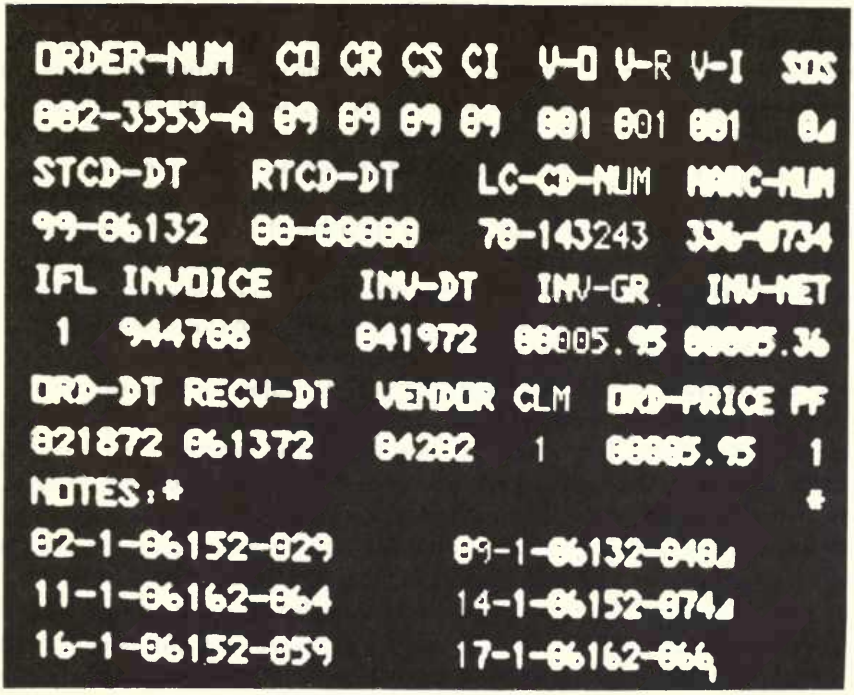



**Fig. 7. Display Screen Showing Order Information**

Most administrative functional areas of the Amherst and Boston campuses are connected by visual display terminals to the System/370, Model 145. Applications such as the university personnel records, payroll, student records, housing, grades, and class scheduling are already functioning in highly refined forms. By the time the processing service was established, the library had already implemented an on-line acquisitions and a precataloging system using six of the visual display terminals.

With this staff and computing facilities, the design of the system to be used for the processing service was initiated. Because of the expected short life of the service, it was decided at the onset that only "off the shelf" hardware and software would be utilized for any data processing techniques used. It was realized that taking this approach might sacrifice efficiency for availability, but realizing that time was of the essence this sacrifice had to be made.

In spite of the wide range of functions being performed by the Administrative Data Processing Center, a number of constraints are placed upon any user of the facility. First, although a teleprocessing capability was provided, it was not a highly sophisticated facility, and as such did not support the use of interactive display terminals. Furthermore, in considering the application of on-line techniques, the scarcity of file space was always a primary concern. Also, the personnel at the center did almost all of their programming in COBOL. Although other languages, such as BAL, PL/1 and RPG were provided and could be used, few, if any, personnel at the center were knowledgeable about the use of these languages. Since the library and information systems staff was required to rely on this personnel for any problems that might arise, the decision to utilize COBOL was obviously influenced by the center.

In addition, the facilities available did not allow the library to fully investigate and explore various methods of data entry. As a result, it was decided that keypunches would perform all of the functions required. Although they are not considered by many to be efficient data entry devices, the equipment itself was readily available, and was in fact capable of performing the required functions. Finally, and probably most important, the most significant constraint imposed by the Administrative Data Processing Center was that it was operating under the disk operating system, and as such did not allow for any on-line storage and access of variable length bibliographic records. The use of the indexed sequential access method meant that only fixed length records could be used for any on-line applications.

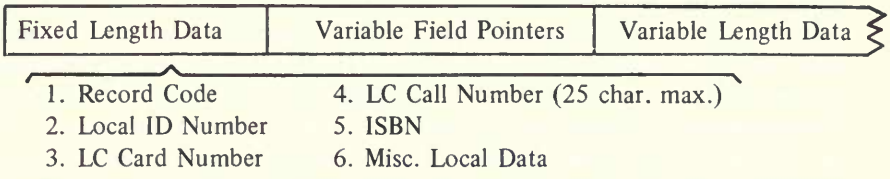
Any one of these above constaints can significantly influence the manner in which a system can function. Taken as a whole, they played a very significant factor in the manner in which the processing service functions were designed, and the manner in which data processing techniques were utilized to perform them.

Two basic types of file structures are used in performing the functions of the processing service. All bibliographic data, which by nature are variable in length, are retained on magnetic tape files. As has just been mentioned, one of the primary reasons for this is that DOS does not support variable length records on disk files. As a result, all bibliographic data used by the processing service, which consists of MARC as well as non-MARC data, are stored on magnetic tape. To date, the MARC file is segregated from the local file. The MARC records are retained in their communications format with the addition of a 50-character leader that contains information used for retrieval purposes. The local file is retained in order number sequence, while the MARC file is retained in LC card number sequence.

Whenever a MARC record is used for bibliographic information, the first step taken is to convert the MARC record to the local format. The primary

reason for doing this is two-fold: (1) it was deemed unnecessary to convert or process any MARC record until the data were actually requested; and (2) all programs to maintain the local bibliographic files and produce such products as catalog cards and miscellaneous listings were written to work with records in the local format.

The local bibliographic record contains all information necessary to describe a given item. The general format for local bibliographic records is as follows:




As with any variable length record, the beginning portion of this record contains certain fixed length information such as the local ID and LC card number.

Following the fixed length data, a series of 99 pointers exist in the record which refer to all of the possible data elements that can exist. For example, field Ø1 would be used if there were an author main entry, while field 95 would be used to contain the complete LC call number. Also, there are groups of fields assigned for other types of bibliographic data, primarily the notes and tracings. As an example, notes may occupy fields 13 through 29, while the series tracings may occupy fields 9Ø through 92. Although this type of format differs considerably from the MARC format, it was established at a time when MARC was just coming into use. Furthermore, this type of format is easier to work with on a continuing basis.

If a pointer value is non-zero, it indicates where the data for the field start in the variable length portion of the record. After going to this particular location in the record, the first two bytes of information indicate the actual length of the data. Although this may not be the most desirable format to be used for variable length data, it should be said that this is the format that some of the initial BCL records were in, and therefore played a determining factor in the format to be used for all local records.

On a daily basis, records in the local file may be created or changed. For example, if there were an error in the author main entry, a punched card indicating a change for field Ø1 would be created and processed that night. This change to field Ø1 would be made to the record and an edit sheet would be produced so that the appropriate personnel could verify the correction. It

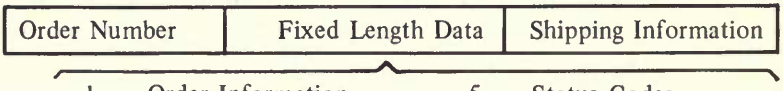
might also be pointed out that the tracings are carried in the record as they will appear as headings. Prior to printing catalog cards, this form of entry is expanded to reflect the format used for printing the tracings in the body of the card. In this manner, all tracings need only be carried in one field and, if updated, will produce both the proper headings and tracings.
tracings in the body of the card to be produced.

The two types of bibliographic records (i.e., MARC and local) maintained by the processing service serve considerably different functions. The MARC records are primarily used to retrieve bibliographic data for either ordering or cataloging purposes. The local bibliographic record, on the other hand, is used to contain ordering data in addition to the bibliographic data. Once a MARC record is retrieved, it is transferred to the local file, where all of the necessary updating and processing programs can work with the record.

In addition to producing bibliographic data for ordering and cataloging purposes, records in the local file perform a much more significant function. Since the data did not come from MARC, it must be verified and corrected before cards can be printed. This requires processing in a daily update run in order to complete the bibliographic entry. Each time a change is made to a bibliographic record, a new edit sheet is generated so that the change may be verified. Further, these records are used for such procedures as claims, cancellations, order notifications, as well as various line entry listings, and even for the production of book catalogs. In effect, although the MARC file is a primary source of bibliographic data, the manner in which the MARC data are utilized centers around the local bibliographic file and its contents.

Since DOS does not support variable-length ISAM records, the only manner in which on-line activities could be performed was to utilize fixed length records. As a result, it was decided to maintain a processing file on-line; this consists primarily of bookkeeping or accounting type information for each item in process at any point in time. The processing file is structured as shown below.

Primary Record




1. Order Information
2. Vendor Number
3. Receiving Information
4. LC Card Number
5. Status Codes
6. Report Codes
7. Invoice Information
8. Notes

Secondary Record

| Order Number | Shipping Information |
|---|---|

This record not only records such information as vendor number, LC card number, and invoice information, but it is also used to control the final disposition of each volume of any given order. This is done primarily by the information that appears in the shipping area of the record. All data preceding the shipping information refers to all copies of all volumes of an order. Again, because of DOS ISAM limitations, it was necessary to develop a chain-type fixed length record to contain all of the information that might possibly exist for a given order. This is accomplished as shown by the primary and secondary records. If six or less copies of the title are ordered, only the primary record is needed, since the shipping portion of the primary record can accommodate six copies shipped. If, however, more than six copies of an item are ordered, provision has been made to allow for these extra copies to be recorded when shipped. This is accomplished by setting an indicator in the first, or primary, record to indicate that a secondary record exists. Since the primary record contains all of the fixed length data necessary for the order, the secondary record now has room to record shipping information for an additional twenty-three copies of an item. By utilizing this approach, it has been possible to accommodate essentially variable length data within fixed length records. Although this is hardly a novel approach, it is usually done by the system, and not by the programmer.

The processing file is normally maintained via batch programs. Some of these programs are used to indicate shipping and receiving processing, and are run on a daily basis. Others, for example, the programs necessary to produce a new batch of orders, are run weekly. In either case, records on the processing file are updated or created, and all of the appropriate information is recorded for each record. The processing file itself is used primarily as an inquiry answering mechanism. Since rapid turnaround and response to any queries are extremely important to the processing service, it is desirable to determine the status of a given order as quickly as possible. In addition, it is extremely convenient to be able to alter any bookkeeping or control type information as soon as possible and while looking at all of the information, rather than batching this type of change.

One final significant functional characteristic of the processing service is the manner in which bibliographic records are retrieved from either the local or the MARC bibliographic files. Since these records are stored on magnetic tape, on-line retrieval is of no consequence. Furthermore, since these files

take a relatively large amount of magnetic tape for storage, processing on a daily basis is also not feasible. As a result, a procedure was established by which all areas included in the processing service may search the available bibliographic data on a weekly basis using punched cards as an input request form. The data on this punched card are as follows:

| Identifying Information | Search Information | Misc. Information | Output Codes |
|---|---|---|---|
| Institution | LC Card Number | Vendor | |
| Copies | ISBN | Date of Request | |
| | Type of Search | Control Number | |
| | Type of Output | | |

Since the bibliographic search request cards can be used to request records for ordering purposes as well as bibliographic or catalog card purposes, a variety of information can appear on the card, as is shown above. However, depending on the type of output requested and the type of search being performed, various data elements are entered on the punched card. For example, if the type of search being performed is based upon an ISBN request, and the output required is an order for the processing service, the proper codes would be entered in the "type of search" and "type of output" fields. This would then trigger the requirement to enter other information such as institution and number of copies, as well as the vendor. Although each search request does not result in the retrieval of a bibliographic record, entering all of the required information at the search stage provides rather close control over the entire search procedure. If the request is only for the production of an edit sheet, the information necessary for ordering could be omitted. The date of request and control number may be entered to provide this information on the edit sheet, as well as other listings which are produced as a result of the search.

Although the final result of the search is to retrieve a full bibliographic record, the search itself is actually performed against an index. This index contains ISBN and LC card numbers for all items that are accessible on the MARC and local bibliographic files. The search first verifies the existence of an item by searching the index. If an item is in the index, the location of the complete bibliographic record is indicated, and it is only after all items for all areas have been processed against the index that the actual retrieval of the bibliographic data occurs.

Although this search procedure does not provide on-line searching, it has proven extremely beneficial over previous procedures employed. Because

of the flexibility of the data that may be entered on these search request cards, the various areas initiating searches are able to have their requests answered and listings produced for only their area, and are not required to extract what they require from what is done for the entire search. Undoubtedly, one of the most significant benefits of the above procedure over previous ones is the amount of computer time saved. On occasion it has taken as little as 25 percent of the previous time needed to perform a search against the bibliographic files. Currently, as many as 9,000 search requests may be processed against a total bibliographic data base in excess of 440,000 records in approximately 40 minutes of computer time. This time includes not only the amount needed to perform the actual search, but also includes the production of all output required as a result of a normal search.

In spite of the constraints placed upon the processing service by the facility it is utilizing, the processing service has demonstrated that it is possible to perform the necessary functions without extremely large machines or sophisticated systems. The entire range of processing service functions, centered around the existence and maintenance of the processing and bibliographic files discussed earlier, are performed in a straightforward and efficient manner. Furthermore, it is only by the search procedure discussed that an efficient and inexpensive approach towards retrieving data from the bibliographic files has been achieved.

## Improvement Efforts

As is well known to anyone who has been involved in library networks or processing centers, it is very difficult to determine how the products and services provided by the network or center are being accepted by the recipients. Are the results of the network or processing effort being used to advantage? In fact, are the results being used at all? What alterations are being made to the products? How necessary are the alterations? To what extent, if any, do these alterations negate the value of the network or processing center's work? How do the users rate the overall quality of the products and services? These are a few of the problems that all cooperative efforts face.

In order to find the answers to such questions, a survey was carried out with the BCL participants. A questionnaire of 25 queries was distributed in an effort to determine the way in which the processing services output was being used, how the participants felt toward the processing center, what effect the center's operations were having on the participant libraries, and to elicit suggestions and ideas for improvement. We are not here concerned with the survey itself, and, therefore, we will discuss only those results that are of more than local interest.

Out of the 28 libraries queried, 25 returned questionnaires. Nine were community colleges, 12 were state colleges, and the remaining 4 were 1 of each, a medical, art, maritime, and technical school. It was pleasing to determine that all 25 were using the BCL computer-produced catalog cards, and that all but one rated the quality of the cataloging as good, very good or excellent. Most of them (17) proved consistent by stating that they made alterations to 5 percent or less of the cards received. Of the remainder, one made changes to 55 percent of the cards, another made 50 percent, two made 30 percent changes, and the others were in the 6-15 percent bracket. These changes were primarily to the added entries, subject headings or call numbers.

All but 6 of the libraries use the spine labels provided, and those 6 prefer Se-Lin labels.

Among the more significant questions, two were asked that it was felt would indicate the degree of success the BCL effort has had in the area of personnel savings. These questions were as follows:

1. What impact has the acquisition of materials through BCL had on the size of your processing staff?
2. If your library had received its share of the BCL funds without the processing center being established, how many additional personnel would you estimate would have had to be added to your present staff in order to handle the workload?

It was felt by those designing the questionnnaire that if BCL had had no appreciable effect on processing staff sizes or if such staffs had to be largely increased in order to handle the BCL products, then the project was not successful in one of its major purposes. In addition to building good collections in the participant libraries, BCL was expected to accomplish its goals with little or no increase in processing staffs in the libraries or, even better, with a decrease in staff.

To the first question above, 17 libraries answered no effect on the size of their processing staffs, 2 claimed a decrease, and 6 stated that there had been an increase. Other questions and comments revealed that many of the staffs were so small that they could not decrease–hence, no effect. In the case of the six instances of increase, clerical level personnel was needed to cope with the increase of that type of work occasioned by the continuous flow of new materials from BCL.

The second question was the really significant one. The answers to that question indicated that 19.5 new professionals and 48 new clerks would have had to be added to the staffs of the 25 answering libraries in order to handle

the workload of processing the new materials if the processing center had not existed.

This result in itself seems good justification for centralized processing. Unfortunately, it would require almost a scientific investigation to determine the actual dollar savings in a really credible form. In terms of generalization, however, the total annual salaries of 19.5 *beginning* professionals would amount to $171,600 and the total annual salaries of 48 *medium* level clerks would amount to $302,400. The total amount of processing funds provided by the legislature for all 29 libraries (not just the 25 anwering the questionnaire) was $123,000 for 1972/73. Even on this very rough basis, it appears that $351,000 was saved in fiscal year 1972/73 in estimated personnel costs.

The area of acquisitions, including selection, is fraught with problems in the individual library, and many of the same problems are extant in the centralized processing center as well. Two of those problems that the questionnaire brought out are the time lag between order and receipt and the lack of claiming. Of the former item, it seems that no time is ever fast enough. Of the latter, if the jobber or publisher does not respond to claims, it is the processing center that looks bad to the network participants. There is, however, no library or processing center that cannot improve in these areas.

Many of the survey respondents commented on the contribution BCL has made to developing their collections. Some felt that their research potential had been greatly enhanced, others indicated that the project had enabled them to build good supportive collections. One commented that his institution was now "literally accreditable." In regard to how well BCL was meeting the acquisition needs of their libraries, twenty respondents rated the center as "satisfactory" or better. Three of the remaining five felt that they needed "more latitude in choice of materials." In all probability, these libraries would have liked to acquire more nonprint materials than the agreed upon 15 percent of their BCL budgets allowed.

One of the more interesting questions in the survey asked the participants to describe the impact the BCL project has had on their libraries. Many of the statements indicated an appreciation for the greatly enlarged and improved collections that the project provided. In addition, however, a few commented on the "hardship" the great influx of new materials caused their small staffs. Most, however, were glad for the opportunity to build their collections and made comments such as, "created an entirely new library" or "dramatic improvement in quantity and quality." Interestingly, 18 libraries made special comments indicating their satisfaction and belief in the cooperative effort. Many of them stated they felt BCL demonstrated that cooperative efforts worked, and expressed a wish to develop other such ventures.

Finally, to the request, "Briefly list any changes you would like to see made in the BCL project," 16 participants mentioned the selection process. The biweekly distribution of selection cards produced from the MARC tapes is no longer held in great favor by some of the participants. Those librarians made it clear that they want alternate tools for selection and more qualitative information about books than MARC provides. Since MARC is the only ongoing source for machine-readable bibliographical data, this request will be a very difficult one to satisfy.

## Costs and Statistics

Due to the fact that BCL-73, the present year, has not yet ended and, therefore, there is no way to know what the statistics will be for this year, the following costs and statistics are for the 1969 through 1972 fiscal years, unless otherwise specifically indicated. They are generalized estimates rather than precise cost figures because of the continual improvements made in both the manual and the machine systems during the course of the year. Further, it is impossible to determine exact machine costs for the year because all of the equipment used for BCL is also used for other purposes. These factors, therefore, make it impossible to arrive at precise data. The figures in table 1 should be regarded as informed estimates.

In spite of the changes in the economics of the operation that have evolved because of the loss of coordinated acquisitions and the increase in cataloging effort (which are looked upon as natural outgrowths of a maturing library processing network), we believe that the center has established itself as one of the most successful users of library data processing techniques in the country and had proven that a well-designed automated system is the key to modern, efficient, rapid and inexpensive processing of library materials.

## REFERENCES

1. Voigt, Melvin, J., and Treyz, Joseph H. *Books for College Libraries; A Selected List of Approximately 53,400 Titles Based on the Initial Selection Made for the University of California's New Campuses Program. . . .* Chicago, ALA, 1967.

2. International Business Machines Corp. *Massachusetts Central Library Processing Service.* Application Brief GK20-0647, White Plains, N.Y., IBM Corp., 1973.

3. Kilgour, Frederick G. "Computer-Based Systems, A New Dimension to Library Cooperation, *College & Research Libraries*, 34:137, March 1973.

| *Fiscal Year* | *Coverage* | *Book Funds* | *Processing Funds* |
|---|---|---|---|
| 69/70 | BCL-70 Titles from the bibliography *Books for College Libraries* (Chicago, ALA, 1967) | $2,000,000 | $250,000 |
| 70/71 | BCL-71 Titles from MARC tapes, backfiles of periodicals, special bibliographies | $2,000,000 | $250,000 |
| 71/72 | BCL-72 Titles from MARC tapes, some nonprint materials, any in print title from the world trade | $1,500,000 | $175,000 |
| Total | | $5,500,000 | $675,000 |

Volumes purchased, cataloged and distributed**: 650,000

Volumes purchased, cataloged and distributed**: (1969/72) 650,000 volumes

Periodical backfiles purchased, cataloged and distributed: (1969/72) 1,500 titles

Catalog cards produced: (1969/72) 3,200,000 cards

In addition to the data above, the per volume costs for each completed year of BCL operation were as follows:

| | | |
|---|---|---|
| BCL-70 | | $ .83 |
| BCL-71 | | .90 |
| BCL-72 | with MARC data | .97 |
| | without MARCdata | 1.86 |

In order to present a record as up-to-date as possible, the following are data for the 1972/73 year.

| | *Book Funds* | *Processing Funds* |
|---|---|---|
| BCL-73 | $1,425,000 | $123,000 |

Estimated volumes purchased, cataloged and distributed**: 118,000 volumes

Estimated Catalog cards produced: 600,000 cards

**Excluding microtext units, backfiles, and nonprint materials.